

Project **REPORT**

Hadong power station

South Korean Power Station installs Pennguard® linings to prepare six concrete chimneys for FGD operation.

The main utility of South Korea, Korea Electric Power Corporation (KEPCO), operates 33 coal fired power units with a combined generating capacity of 13,031 MW. In 1994, KEPCO decided to install flue gas desulfurization (FGD) plants on all of its coal fired units. At that moment, one of KEPCO's largest and most modern coal fired stations, near the southern city of Hadong, had two units in operation and two under construction, while two more were being planned. After a detailed study, KEPCO concluded that the change to FGD operation called for a modification of the existing chimneys as well as of those in the construction and design stages.

Before the introduction of FGD, the standard chimney design for KEPCO's coal fired power stations was a 492 ft high concrete chimney, protected internally with a sectional ceramic brick liner. The brick liner was placed directly on the inside of the concrete windshield, leaving room only for thermal insulation, but not for a ventilated air space.

The addition of FGD plants to the 500 MW units would bring the temperature of the gas stream down to 185°F. For the chimneys of Hadong Power Station, this would create a technical

risk; the cool gas stream could easily penetrate through the internal brick liner and acid could condense in the narrow space between the brick liner



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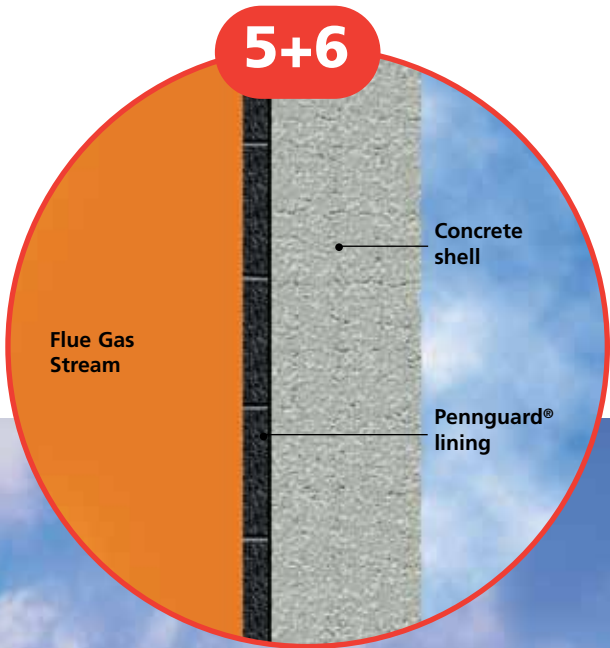
Duct & Chimney Linings

and the concrete shell. This acid condensate would chemically attack the concrete shell, which could eventually threaten the structural integrity of these chimneys.

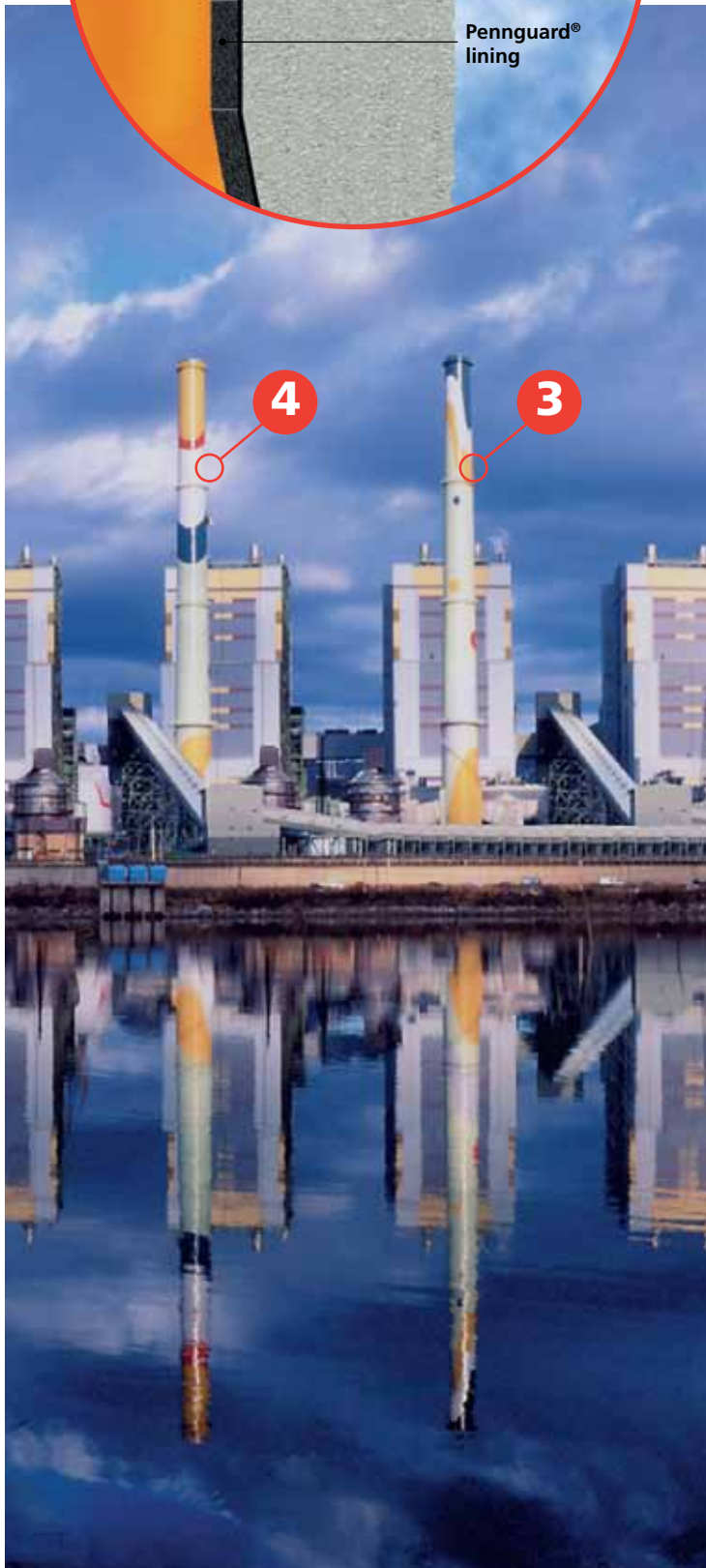
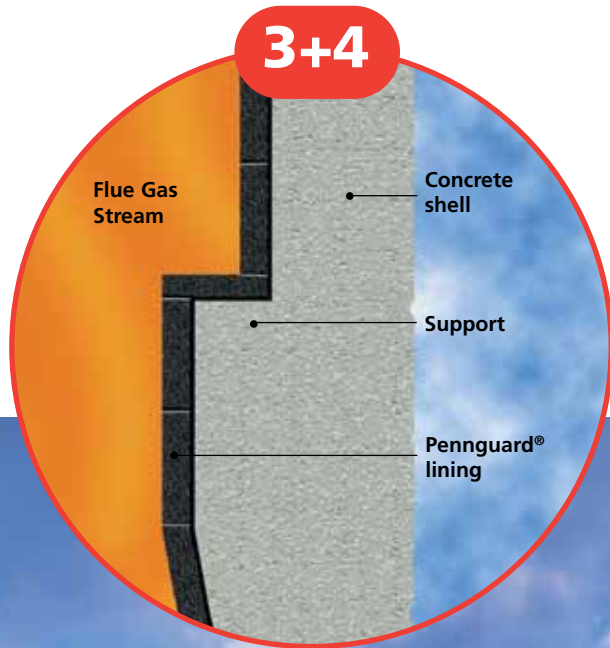
In looking for a solution to the expected problem, KEPCO decided that a lining should be installed on the ceramic brick, or possibly directly on the concrete shells. The lining would have to be acid resistant and impermeable to flue gas and acid condensate. Furthermore, it should be possible to install the lining quickly, without time consuming structural changes to the chimneys.

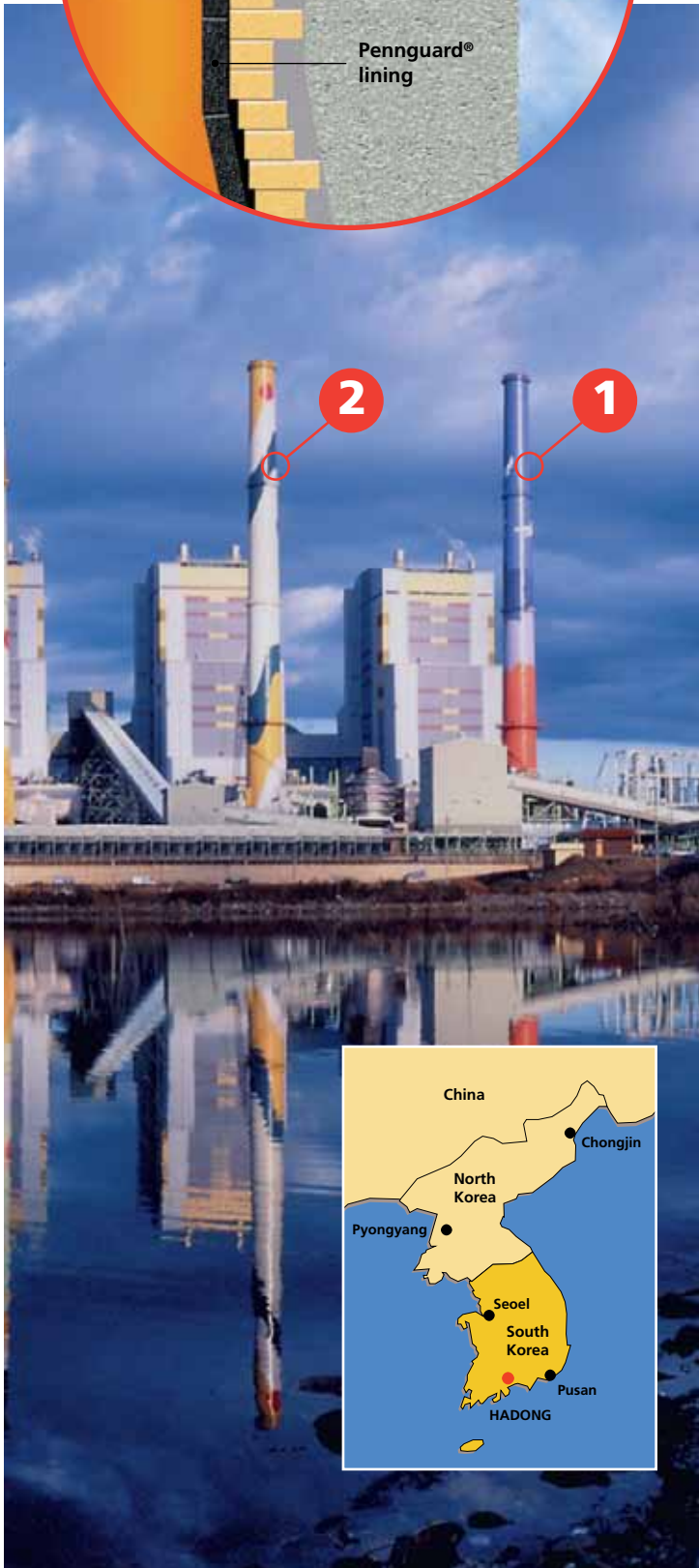
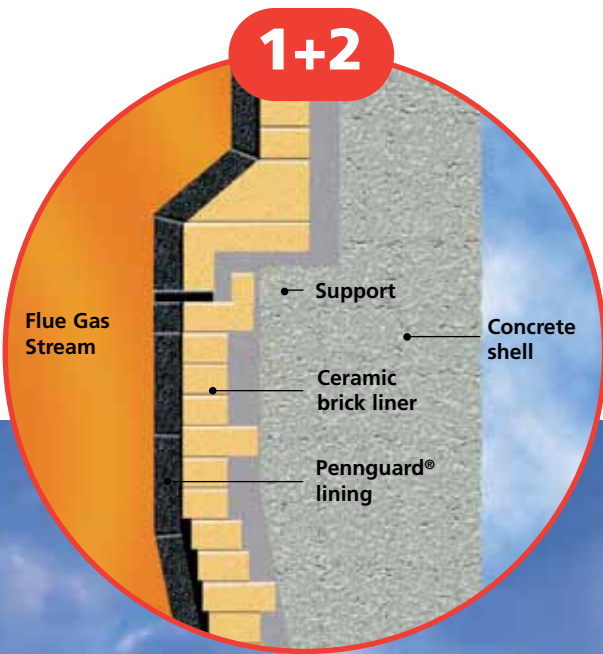
After a detailed investigation, the Pennguard® Block Lining System was selected for the chimneys of Hadong Power Station. Between 1997 and 2000, the six chimneys, with a total internal surface of 290,600 ft² have been lined with Pennguard® in a step-by-step process. ♦

5+6



3+4





Hadong Power Station has used Pennguard® linings in three different ways:

1+2

Units 1 and 2:

Pennguard® linings were applied directly to the brick liners of these existing chimneys.

3+4

Units 3 and 4:

Although the chimneys were designed to receive brick liners, these were not installed. Instead, Pennguard® linings were applied directly to the inside of the concrete shells.

5+6

Units 5 and 6:

These chimneys were designed to receive Pennguard® linings directly on the inside of their concrete shell. The concrete shell does not have any internal supports, as these are not necessary for a lightweight Pennguard® lining.

HADONG POWER STATION

Operational details

Size: 6 x 500 MW

Fuel type: coal

Sulfur %: 0.8-2.0%

Flue gas volume:

1 million scfm

SO₂ before FGD: 1,035 ppm

SO₂ after FGD: 100 ppm

Pennguard® linings: suitable for brick and concrete

Pennguard® linings are often applied to steel substrates, but more and more frequently, customers choose to install Pennguard® on existing brick flues as well as on existing concrete shells.

The following properties of the Pennguard® Block Lining System are key factors to its suitability for brick and concrete substrates:

1 A Pennguard® lining provides a positive barrier between the brick/concrete and the flue gas environment; Pennguard® totally seals the substrate from any contact with flue gas and acid condensate.



Unit 6 chimney under construction



Lining application



Penntrowel® Epoxy Primer seals the concrete surface

2 A Pennguard® lining is strongly insulating. As a result, it will protect a brick chimney flue or concrete shell from high flue gas temperatures and temperature shocks.

3 A Pennguard® lining is lightweight (3.1 lbs/sqft at a lining thickness of 2 1/8 "). This means, that no structural changes or support anchors are needed for lining installation.

4 A Pennguard® lining is tolerant of the small imperfections that can always be found in any ceramic brick or concrete surface.

If necessary, the installation of a Pennguard® lining in an existing chimney can be done very quickly. In the case of Hadong Power Station, the entire program for lining one chimney (48,440 ft²) took an average of 42 days. ♦



Lining application

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